

REMARKS

Applicants acknowledge receipt of a Final Office Action dated August 3, 2006. In this response Applicants have amended claim 1. Following entry of these amendments, claims 1-5 are pending in the application. Applicants note that the Office Action refers only to claims 1-4 even though claim 5 remains pending.

Reconsideration of the present application is respectfully requested in view of the foregoing amendments and the remarks which follow.

Rejections Under 35 U.S.C. § 102

On page 2 of the Office Action, the PTO has rejected claims 1-4 under 35 U.S.C. § 102(b) as allegedly being anticipated by U.S. Publication 2002/0173085 to Nakajima et al. (hereinafter “Nakajima”). Applicants respectfully traverse this rejection for at least the reason set forth below.

A claim is anticipated only if each and every element as set forth in the claim is found, either expressly or inherently described, in a single prior art reference. *Verdegaal Bros. v. Union Oil Co. of California*, 2 USPQ2d 1051, 1053 (Fed. Cir. 1987). See generally MPEP §2131.

Here, Applicants submit that Nakajima fails to disclose “oxidizing a silicon wafer annealed under an environment of hydrogen gas with ozonized water” as recited in independent claim 1.

Generally, a silicon wafer flattened to an atomic level by an annealing treatment is susceptible to contamination with impurities. If nothing is done about this problem, the silicon wafer can become unusable as a highly integrated semiconductor circuit board. Thus, such silicon wafers are badly in need of cleaning. The presently claimed process provides a benefit by providing a cleaning treatment which maintains the step and terrace structure in a silicon wafer which has been flattened up to an atomic level.

In contrast, and as discussed in more detail below, Nakajima’s process does not maintain the step and terrace structure in the flattened silicon wafer surface no matter how the washing treatment is performed once the oxide film is formed (either naturally or through heat treatment) thereon.

In Nakajima's oxidation treatment, prior to laser annealing, an oxide film produced by heat treatment and a natural oxide film are removed using hydrofluoric acid (an etching treatment) before oxidation processing by ozone water spraying, UV light irradiation or application of a sulfuric acid and hydrogen peroxide mixture, each of which has the effect of removing organic substances, such that semiconductor film surface is covered with a clean oxide film. Further, Process B is disclosed in the specification at paragraphs [0094] and [0095] relevant to FIG. 1B that hydrofluoric acid processing (HF processing) is performed after cleaning using ozone water (hydro cleaning) and another ozone processing (hydro cleaning) is performed additionally after the hydrofluoric acid processing with the result that the dispersion in the threshold voltage becomes smaller to improve the TFT electrical characteristics.

As discussed above, Nakajima essentially requires removal of an oxide film formed by heat treatment or naturally before the ozone water treatment.

However, it is impossible to maintain the step and terrace structure in the flattened silicon wafer surface no matter how the washing treatment is performed once the oxide film is formed naturally or heat treatment thereon.

In contrast, the presently claimed invention recites "oxidizing an annealed silicon wafer with ozonized water." This is to maintain the surface condition of the silicon wafer. In this way, the invention is different from Nakajima.

Further, the paragraph [0030] in Nakajima discusses the use of a laser processing apparatus with processes including hydrofluoric acid processing, oxidation processing, heat treatment, and laser annealing being performed in a non-specified order. Such processes performed in a non-specified order will destroy the atomic level step and terrace structure in the flattened silicon wafer surface.

In contrast, the presently claimed invention recites "oxidizing a silicon wafer annealed under an environment of hydrogen gas with ozonized water." If this is done, an oxide film will be formed on the oxidized silicon wafer to trap impurities. Such trapped impurities are removed by the claimed hydrofluoric acid cleaning step. During the processes, the step and terrace structure formed after the annealing process is successfully maintained.

In other words, by performing the presently claimed steps in the presently claimed order, the step and terrace structure formed on the surface of the flattened silicon wafer surface to an atomic level by annealing is maintained.

Thus, in addition to the process *per se*, the objects and effects of the presently claimed method of cleaning an annealed silicon wafer are different from Nakajima.

In this regard, Applicants note that the step and terrace structure which has been flattened to an atomic level in the silicon wafer surface is only formed during an annealing step under a non-oxidizing atmosphere and absolutely would not be formed in a laser annealing step.

With respect to claims 2-5, Applicants submit that these claims are allowable for at least the same reason as claim 1.

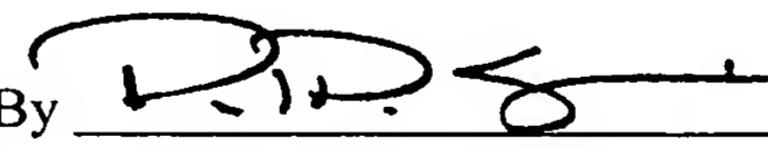
In view of the foregoing, Applicants respectfully request reconsideration and withdrawal of the outstanding rejection under §102.

CONCLUSION

In view of the foregoing amendments and remarks, Applicants respectfully submit that all of the pending claims are now in condition for allowance. An early notice to this effect is earnestly solicited. If there are any questions regarding the application, the Examiner is invited to contact the undersigned at the number below.

Respectfully submitted,

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The Commissioner is hereby authorized to charge any additional fees which may be required regarding this application under 37 C.F.R. §§ 1.16-1.17, or credit any overpayment, to Deposit Account No. 19-0741. Should no proper payment be enclosed herewith, as by a check or credit card payment form being in the wrong amount, unsigned, post-dated, otherwise improper or informal or even entirely missing, the Commissioner is authorized to charge the unpaid amount to Deposit Account No. 19-0741. If any extensions of time are needed for timely acceptance of papers submitted herewith, Applicants hereby petition for such extension under 37 C.F.R. §1.136 and authorize payment of any such extensions fees to Deposit Account No. 19-0741.